(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 374 107 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: 89830535.4

(51) Int. Cl.5: **B65G 47/14**

(22) Date of filing: **01.12.89**

(30) Priority: **07.12.88 IT 4017988**
14.04.89 IT 4005989

(43) Date of publication of application:
20.06.90 Bulletin 90/25

(84) Designated Contracting States:
DE ES FR GB

(71) Applicant: **Lanfranchi, Lino**
Via Milano, 8
I-43044 Collecchio, Parma(IT)

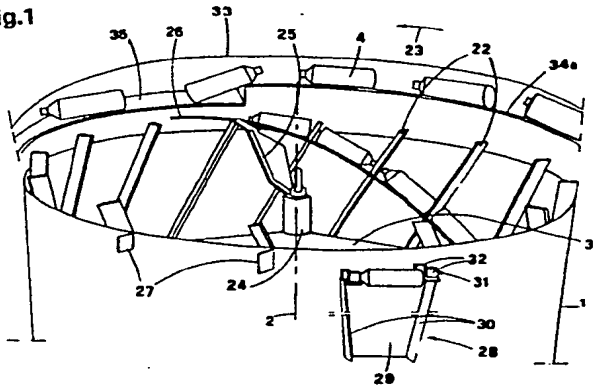
(72) Inventor: **Lanfranchi, Lino**
Via Milano, 8
I-43044 Collecchio, Parma(IT)

(74) Representative: **Lanzoni, Luciano**
c/o BUGNION S.p.A. Viale Trento Trieste, 25
I-41100 Modena(IT)

(54) An improved machine for the erection and alignment of containers such as plastic bottles.

(57) The improvements relate to container-filling systems in general, and automatic bottling systems in particular, and are applied to a machine by which plastic bottles charged in bulk into a cylindrical bin, are ordered into a single file, standing erect with neck uppermost. The improved machine is of the type with a cylindrical charging bin (1) rotatable about a vertical axis and fitted internally with peripheral vanes (22), and a larger diameter coaxial fixed cylinder (33 or 55), which encompasses the bin in such a way as to form a gallery (34 or 55a) accommodating the movement of a ring of erection and alignment chutes (28); the vanes are raked from the vertical at an adjustable angle, in the opposite direction to that in which the bin rotates, and variable in number to suit the size of bottle. Other improvements include the incorporation of stabilization and accumulation guides (34a, 35) into the gallery (34) between the bin and the outer cylinder.

fig.1



EP 0 374 107 A1

Machinery for the erection and alignment of plastic bottles, or cylindrical containers in general, can be divided conventionally into two main categories of design.

One such category of machines comprises a hopper into which bottles are loaded in bulk, consisting in a cylindrical bin with an inclined axis, inside of which a disk rotates about an axis inclined to the same angle as that of the bin; the periphery of the disk is embodied with openings designed to accommodate the bottles.

In another type of machine, the bottles are loaded in bulk into a cylindrical bin rotatable about a vertical axis and affording upright vanes, fitted to its internal side wall, by which the bottles are propelled along a fixed helical guide extending upward from the enclosed conical base of the bin toward its open top, and lying substantially at a tangent to the vanes while distanced sufficiently to permit their rotation.

The machine further comprises a fixed cylinder of greater diameter than the bin, located externally and coaxially in such a way as to create an annular cavity, or gallery, accommodating uniformly spaced means by which the bottles are erected and aligned, and dispensed onto a horizontal conveyor belt that runs tangential to the cavity.

The erection means are carried by the rotating cylindrical bin.

A machine of the second type thus briefly outlined is disclosed in German specification 2 042 547.

These patent machines betray certain drawbacks, among which are low hourly output rates, and the poor stability of certain types of containers when transferring to the horizontal conveyor.

Moreover, a machine of the type is suitable only for handling tubs or bottles embodied with a neck profile.

The improvements disclosed herein are intended as pertinent to this vertical axis type of machine.

A first object of the invention is to bring about a significant increase in the production capacity of erecting and aligning machines for plastic bottles in which the charging bin is rotatable about a vertical axis.

A further object of the invention is to permit of replacing the erection and alignment means to suit the type of bottle handled, and thus to increase the productivity of the machine in relation to the length of the bottle.

The stated objects, and other objects besides, are realized in improvements according to the present invention, which relate to an erecting and aligning machine for plastic bottles of the type comprising a cylindrical, randomly charged rotating bin fitted internally with a plurality of vanes and a fixed helical guide extending substantially at a tangent to the vanes from the base of the bin to its open top, and an outer cylinder coaxial with and of greater diameter than the bin, creating an annular gallery to accommodate the passage of means by which bottles are erected, aligned and transferred to a horizontally disposed conveyor belt running tangential to the gallery; a first characterizing feature of the improvements is that the vanes are angled away from the straight line generators of the cylindrical bin, inclined in the direction opposite to that in which the bin rotates.

An additional feature of the present invention is that the vanes are associated with the bin in such a way as enables adjustment for rake and pitch by varying their number or thickness.

The angle of rake can be altered by tilting the vanes away from a position perpendicular to the base of the rotating bin, to assume an infinitely variable inclination.

Another feature of the improvements disclosed is that the gallery between the rotatable cylindrical bin and the outer cylinder affords a stabilization guide or channel rigidly associated with the outer cylinder, providing a continuation of the helical guide, which accommodates the passage of a ring of lugs rigidly associated with the rotating bin and spaced apart at the same distance as the vanes located inside the bin.

Two preferred embodiments of the invention will now be described in detail, by way of example, with the aid of the accompanying drawings, in which:

-fig 1 illustrates a part of the improved machine, exploded and in perspective;

-fig 2 shows the machine in plan, from above;

-figs 3a and 3b show the section through II-II in fig 2, and the passage of a bottle from the helical guide to the erect position, respectively;

-fig 4 shows a detail of the machine in perspective;

-fig 5 is a perspective of the improved machine, from above, illustrating a possible variation in embodiment of the cylindrical bin;

-fig 6 shows a possible variation in embodiment of the erection and alignment means, viewed in front elevation;

-fig 7 is a side elevation of the means of fig 6, viewed in section through VI-VI;

-fig 8 provides the schematic illustration of a cam serving to operate a central hinged flap of the erection and alignment means of fig 6;

-fig 9 shows a detail of the erection and alignment means of fig 6.

With reference to the above drawings, 1 denotes a cylindrical bin rotatable about a vertical

axis 2, and embodied with a fixed conical base 3 by which containers 4 (plastic bottles), are caused to roll toward the inside wall of the bin.

The conical base 3 is adjustable for height in relation to the bottom of the bin, in such a way that a channel can be created of which the height is variable according to the diameter or transverse dimension of the bottle handled.

Referring to fig 3, the bin is set in rotation by a drive consisting in a shaft 5 and geared motor 6, connected via a disk clutch coupling 7 to a driven shaft 8 that carries a keyed pinion 9 in mesh with a wheel 10 rigidly associated with the bottom 11 of the bin.

12 denotes a first pulley, also keyed to the driven shaft 8, driving a belt 13 which is looped around a second pulley 14, this in turn operating an angle drive unit 15 by which rotation is transmitted to the drive roller 16 of a runout conveyor belt 17 disposed tangentially to the cylindrical bin 1.

The gear wheel 10 turns in a bearing 18 anchored to the main frame 19 of the machine; similarly, the bearings 21 of the driven shaft 8 are carried in a sleeve 20 anchored to the frame.

22 denotes a plurality of vanes fastened to the inside face of the cylindrical bin wall, which are raked at an angle in relation to the straight line generators of the cylinder, and in the direction opposite to the rotation of the bin (arrow 23).

The vanes 22 are screwed in place, or made fast by other removable means, so as to permit of altering the angle of rake, or of adapting their number to suit the longitudinal dimensions of a given bottle, in such a way that output can be increased when handling smaller size items.

Thus, the pitch of the machine, i.e. the distance between one vane and the next, can be altered by varying the number of vanes installed or replacing the existing number with others of different depth.

The angle of rake is variable from the vertical, i.e. perpendicular in relation to the bottom of the rotating bin, to any given inclination, and might be selected by way of a single external control connected to pins integral with the relative vanes and slidably accommodated in cam-profiled slots formed in the bin wall.

Also anchored to the main frame 19 of the machine is a post 24 which, in addition to supporting the conical base 3, also carries an arm 25 projecting radially toward the cylindrical wall of the bin and supporting a helical guide 26 that extends from the bottom of the bin up to the open top, substantially tangential to the vanes though distanced marginally from them so as not to inhibit their rotation.

In the example illustrated, the helical guide 26 is fashioned from rod, and distanced from the side wall of the bin by an amount such as will enable a cylindrical bottle to be cradled against the wall.

27 denotes one of a ring of impeller lugs attached to the external face of the cylindrical bin around the top edge, spaced apart uniformly one from the next by a distance commensurate with the length of the bottle 4 and with the pitch of the vanes 22.

28 denotes one of a ring of erection and alignment means, which occupy a position beneath the ring of lugs 27.

Each erection and alignment means 28 consists in a vertical chute 29 fashioned in sheet metal with two downwardly converging side walls 30 and carrying two cradles 31 uppermost, each comprising a pair of blocks 32 spaced at a distance such as permits of accommodating the neck of a single bottle 4.

The distance between cradles 31 is substantially equal to the length of the bottle minus its neck, which locates between the two blocks 32 at either end, whilst the horizontal depth of the chute at bottom is marginally greater than the diameter of the bottle.

The assembly of the rotating bin 1 with its rings of lugs 27 and chutes 29 is encompassed by a fixed outer cylinder 33, disposed coaxial with the bin in such a way as to form a gallery 34 internally of which the lugs 27 and chutes 29 are able to rotate freely. Needless to say, the dimensions of the chute will be variable at will to accommodate the particular size of bottle; similarly, the number of lugs and the number of erection and alignment means can be varied according to the length of the bottle in such a way as to increase the output capacity of the machine when handling smaller sizes.

34a denotes a flat guide attached permanently to the inside face of the outer cylinder 33, which departs from the point where the helical guide 26 terminates and extends through a distance equal to approximately one quarter of the bin circumference, or through a length that can be varied to suit the dimensions of the bottle handled.

The guide 34a in question, which might consist in two parallel rails or in a single flat element, provides a channel on which the bottles assume a stable position in relation to the outer cylinder, of height such as enables the ring of lugs 27 to ride freely above the guide 34a, engaging the bottles brought onto it from inside the bin along the helical guide 26, and propelling them forward.

35 denotes a further guide following on from the stabilization guide 34a, which consists in a flat element extending through a given distance and combining with the cylindrical walls on either side to create an accumulation channel.

This further guide 35 occupies a level below that of the stabilization guide 34a and marginally

above that of the cradles 31 afforded by the chutes 29 below.

In view of the fact that an erecting and aligning system of the type thus described serves generally for handling plastic containers of particularly light weight and limited stability, use is made of an auxiliary conveyor 36 in order to prevent the bottles from toppling over when transferred to the belt 17 of the runout conveyor.

The auxiliary conveyor 36 comprises a belt passed around vertical rollers 37 and offering a plurality of ribs 38 between which compartments are formed to accommodate and accompany the single bottles.

The belt 36 and ribs 38 will be accommodated for the greater part internally of the gallery, running beneath and synchronously with the erection and alignment means, as illustrated in fig 4.

In an alternative embodiment (not illustrated) of the machine as described thus far, the cylindrical bin might be made stationary with the helical guide and the outer cylinder set in rotation, in which case the lugs and the chutes would be associated with the outer cylinder. In an arrangement of this type, the positioning and accumulation guides will be rigidly associated with the bin.

Figs 5...9 illustrate an alternative embodiment of the improved machine in which use is made of a radial arm 48 extending toward the cylindrical wall of the bin on either side and carrying two helical guides 49 and 50 which extend from the bottom of the bin to the open top, substantially tangential to the vanes and distanced marginally from them so as not to inhibit their rotation.

In the example illustrated, the helical guides are fashioned from rod, and distanced from the side wall of the bin by an amount such as will enable a cylindrical bottle to be cradled against the wall.

45 denotes a plurality of erection and alignment chutes associated permanently with the external surface of the rotating cylindrical bin.

The single erection and alignment chute affords a cradle 51 uppermost, the dimensions of which are such as to accommodate one bottle 52.

The cradle 51 consists in two vertical walls 53 terminating at bottom in respective lips 53a that combine to create an opening marginally less than the overall length, i.e. the height, of the single bottle 52.

54 denotes two annular tables located between the rotating cylindrical bin and a fixed outer cylinder denoted 55, disposed coaxially with the bin 1 in such a way as to create a gallery 55a internally of which the cradles 51 and the erection and alignment chutes 45 are able to rotate freely; more exactly, the two tables 54 provide a continuation of the two helical guides, extending a limited circumferential distance in each instance.

Each erection and alignment chute 45 comprises two substantially upright walls 56, converging downward in such a way as to create an essentially frusto-pyramidal enclosure of which the bottom section is divided by a fixed partition 57 into two funnels of width marginally greater than the diameter of the container or bottle 52.

58 denotes a hinged flap mounted centrally in the chute, directly above the fixed partition 57.

The flap 58 is rigidly associated with a pivot 59 supported by the front and rear walls of the chute, which are denoted 60 and 61 respectively.

62 denotes a following roller, carried rotatably by a lever 63 which is also associated rigidly with the pivot 59. The lever 63 is a fulcrum type, rotatable about the axis of the pivot 59, of which the load end is subject to an elastic restraint in the form of a spring 64; the follower 62 is mounted to the effort end of the lever, and engages in rolling contact with a cam 65 carried by the fixed outer cylinder 55.

The profile of the cam, which is illustrated in the development of fig 8, commences with a slope 66 that enables the follower 62 to rise and induce the flap 58 to move away from the position of fig 6 shown in bold line to that shown in phantom line.

There follows a drop 67 from the total lift height of the cam, which serves to return the flap 58 a short way toward the bold line position of fig 6.

The movement in question helps to correct the shape of a bottle that may have found its way into the chute in a deformed condition.

68 denotes a further drop occurring prior to the return of the flap to its original position, the purpose of which is again to correct any loss of shape exhibited by the bottle.

Also illustrated in fig 8 are the positions of the helical guides 49 and 50, and of the tables 54, in relation to the cam 65.

The erection and alignment chutes thus described enable a more thorough exploitation of the full circumference of the cylindrical bin, inasmuch as the output of the machine, per unit diameter, can be substantially doubled in practice.

70 denotes a table conveyor (fig 7) of conventional embodiment, disposed horizontally and running at a tangent to the annular gallery 55a.

71 denotes a further table which occupies an arc of the gallery essentially equal to the space between the two ends of the cam; the relative positions are illustrated in the development of fig 8.

This further table 71 serves to prevent toppling, in the event that use is made of a compartmental conveyor 72 to steady unstable bottles on emerging from the annular gallery 55a.

Claims

1) An improved machine for the erection and alignment of containers such as plastic bottles, of the type comprising:
-a cylindrical, randomly charged rotatable bin (1) provided internally with a plurality of vanes (2) and a fixed helical guide extending substantially at a tangent to the vanes from the bottom of the bin to its open top;
-a fixed outer cylinder (33 or 55) coaxial with and of greater diameter than the cylindrical bin, and creating an annular gallery to accommodate the passage of means (28 or 45) by which bottles are erected, aligned and transferred to a horizontal conveyor belt (17) running tangential to the annular gallery;
characterized
in that the vanes (22) are raked at a given angle with respect to the straight line generators of the cylindrical bin, in the direction opposite to that in which the bin rotates.

2) An improved machine as in claim 1, wherein the vanes (22) are associated with the rotating bin in such a way as to enable their adjustment for rake and pitch.

3) An improved machine as in claim 1, wherein the cylindrical bin (1) is stationary, and means are provided by which to produce rotation of the helical guide and the outer cylinder about the vertical centre axis of the bin.

4) An improved machine as in claim 1, wherein the rotatable cylindrical bin is provided with a conical base (3) that is adjustable vertically in relation to the bottom of the bin in order to create a channel of variable height.

5) An improved machine for the erection and alignment of containers such as plastic bottles, of the type comprising:
-a cylindrical, randomly charged rotatable bin (1) provided internally with a plurality of vanes (2) and a fixed helical guide extending substantially at a tangent to the vanes from the bottom of the bin to its open top;
-a fixed outer cylinder (33) coaxial with and of greater diameter than the cylindrical bin, and creating an annular gallery (34) to accommodate the passage of means by which bottles are erected, aligned and transferred to a horizontal conveyor belt running tangential to the annular gallery;
characterized
in that the annular gallery (34) created between the rotating cylindrical bin and the fixed outer cylinder accommodates a stabilization guide (34a) rigidly associated with the outer cylinder and providing a continuation of the helical guide, by which passage is afforded to a ring of impeller lugs (27) rigidly associated with the exterior of the rotating bin and spaced apart one from the next through a distance identical to the pitch of the vanes (22) associated with the interior of the bin.

6) An improved machine as in claim 5, further comprising an accumulation guide or channel (35) positioned in continuation from the stabilization guide (34a) and occupying a plane lower than that occupied by the stabilization guide.

7) An improved machine as in preceding claims, further comprising an auxiliary conveyor (36) accommodated internally of the gallery and emerging therefrom together with the horizontal conveyor belt (17), which serves to maintain the bottles erect and is embodied as a belt loop passed around vertically disposed drive rollers and exhibiting a plurality of ribs (38) spaced apart at a variable distance one from the next in such a way as to create a succession of moving compartments located beneath and driven synchronously with the erection and alignment means.

8) An improved machine for the erection and alignment of containers such as plastic bottles, of the type comprising:
-a cylindrical randomly charged rotatable bin provided internally with a plurality of angled vanes;
-a fixed outer cylinder coaxial with and of greater diameter than the cylindrical bin, and creating an annular gallery to accommodate the passage of a plurality of chutes by which bottles are erected, aligned and transferred to a horizontal conveyor belt running tangential to the annular gallery,
characterized
in that it comprises at least two fixed helical guides (49, 50) extending substantially tangential to the vanes (22) from the bottom of the bin to its open top.

9) An improved machine as in claim 8, comprising a plurality of erection and alignment chutes (45) of substantially frusto-pyramidal shape, each provided with a fixed partition (57) at bottom creating two alignment funnels, and a centrally located, hinged flap (58) located above the partition and serving to direct the bottles into the alignment funnels singly and in alternation.

10) An improved machine as in claims 8 and 9, wherein the rotatable cylindrical bin is encircled by a cam (65) engaged by a rolling follower (62) rotatably mounted to the arm of a lever (63) with which the hinged flap (58) is rigidly associated.

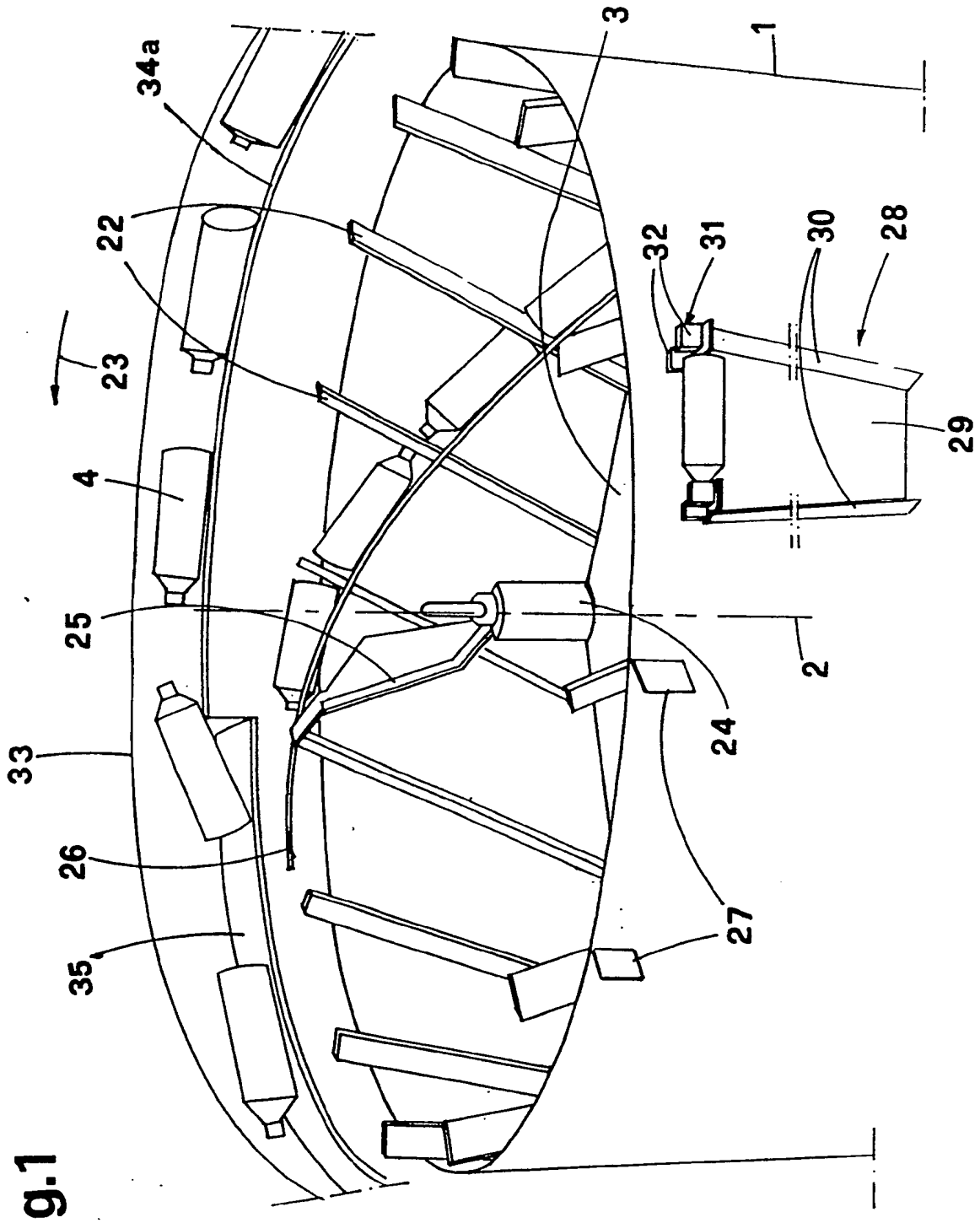
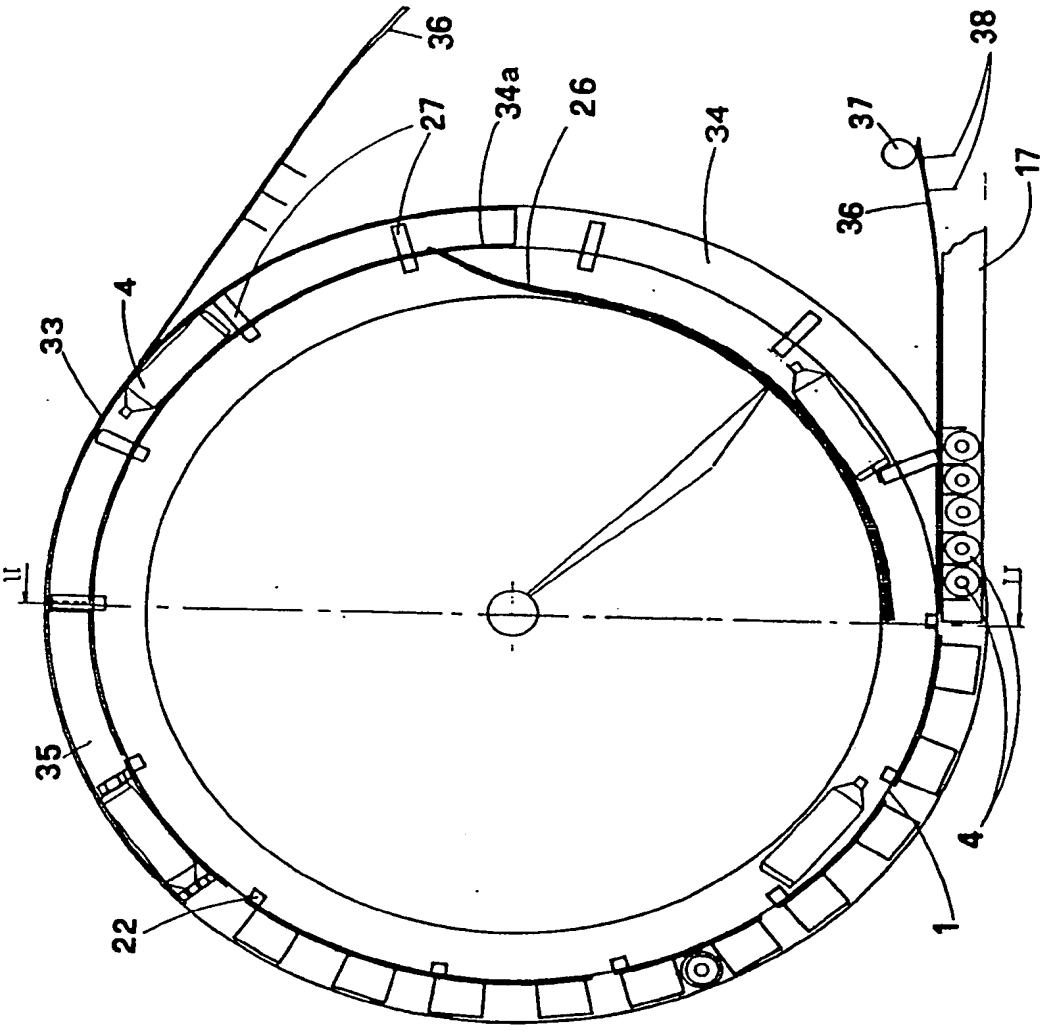


fig.1

fig. 2



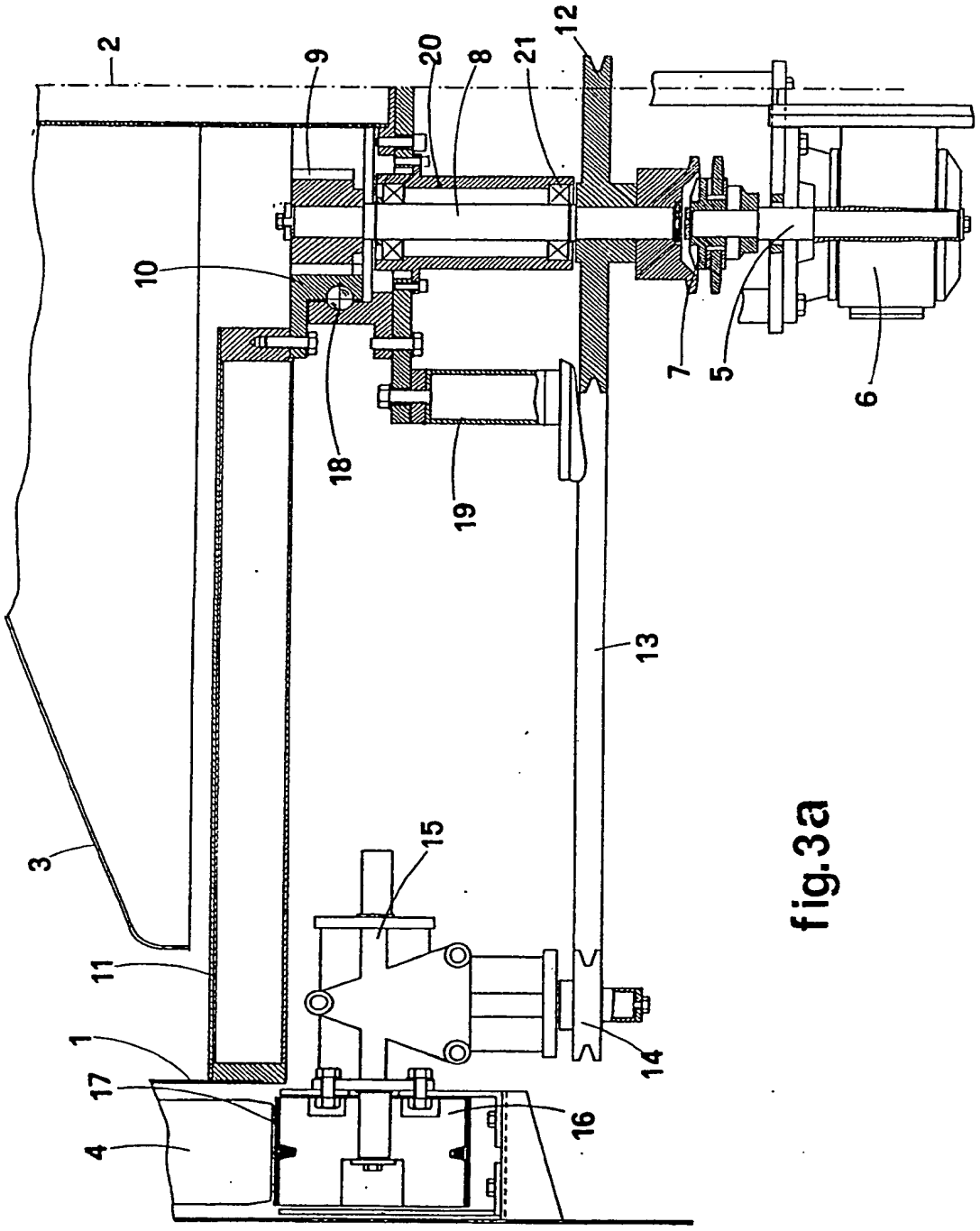


fig.3a

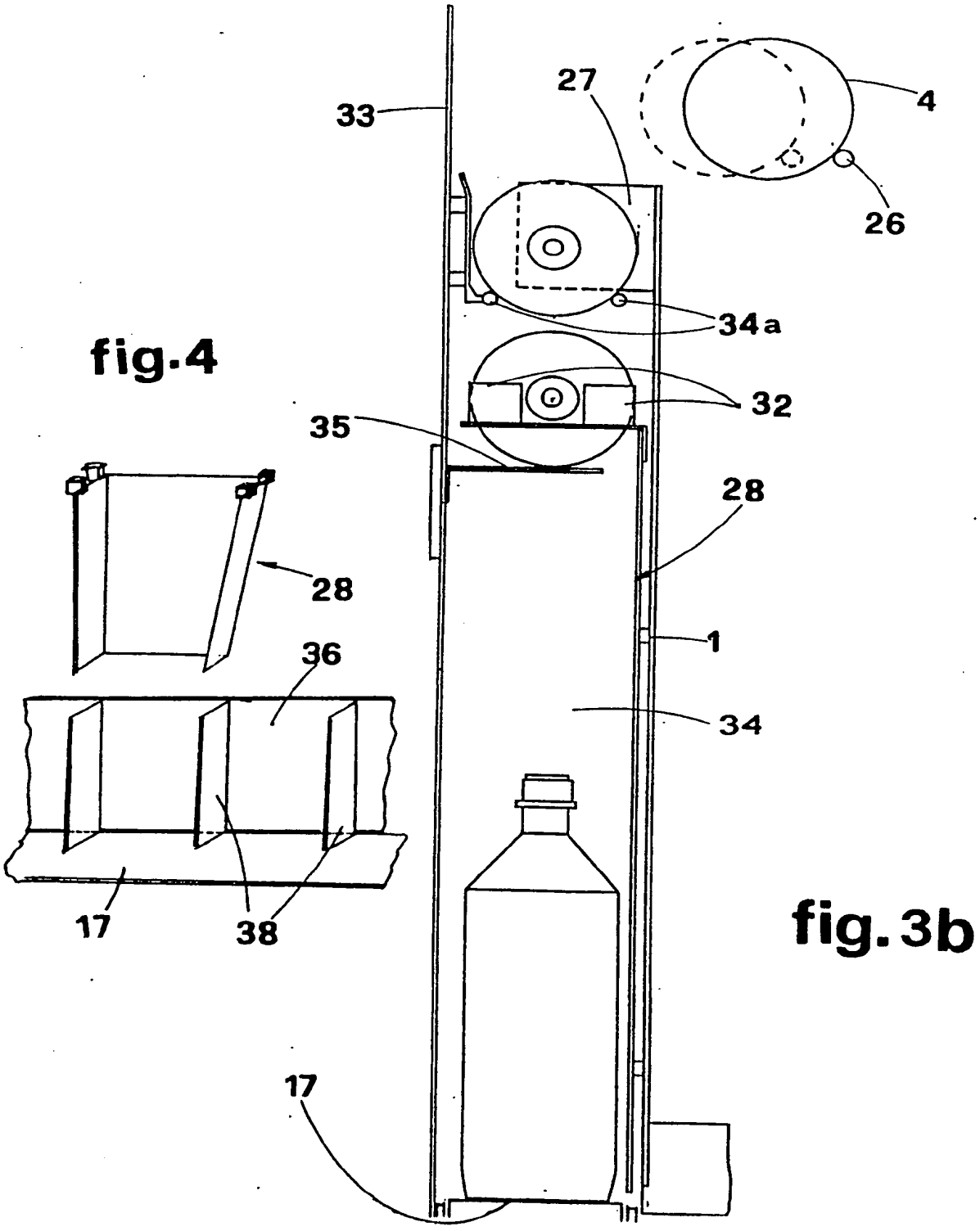
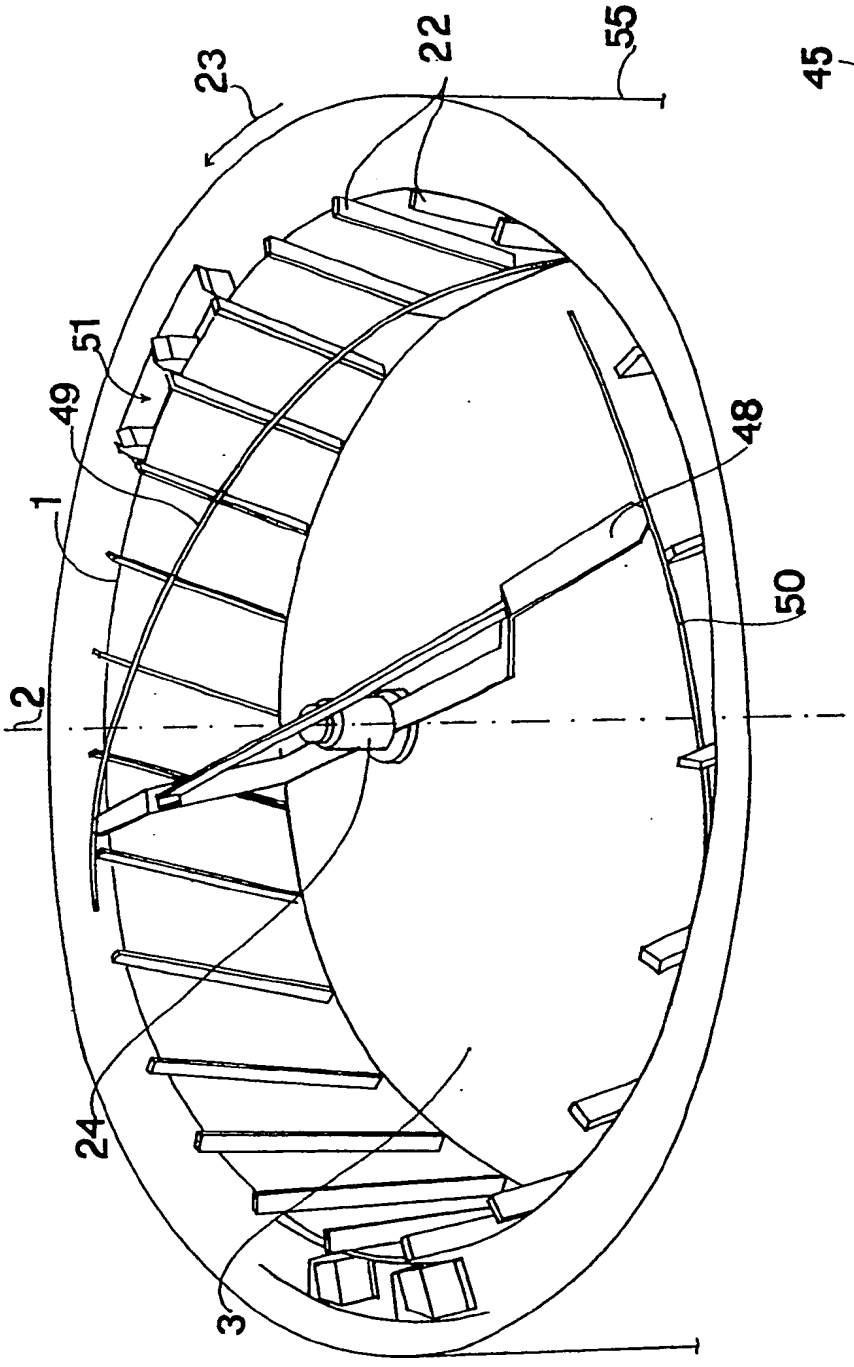


fig.4

fig.3b

fig.5



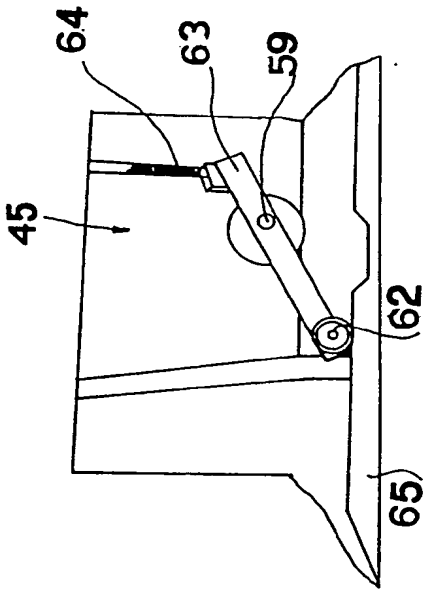
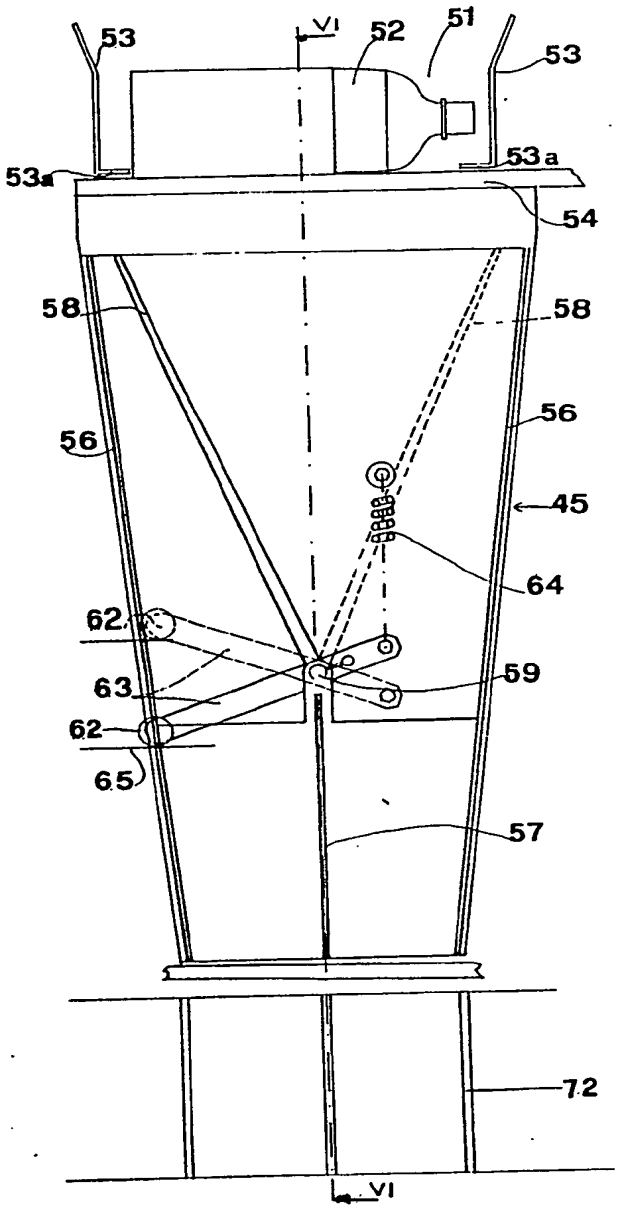


fig.9

fig.6


53
VI
52
51
53
53a
53a
54
58
58
56
56
45
64
62
59
63
62
65
57
72
VI

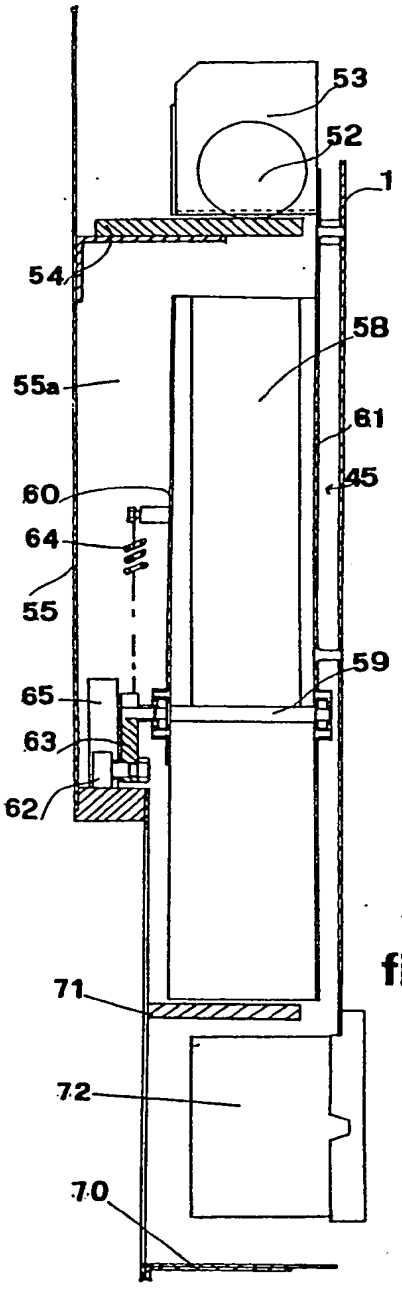
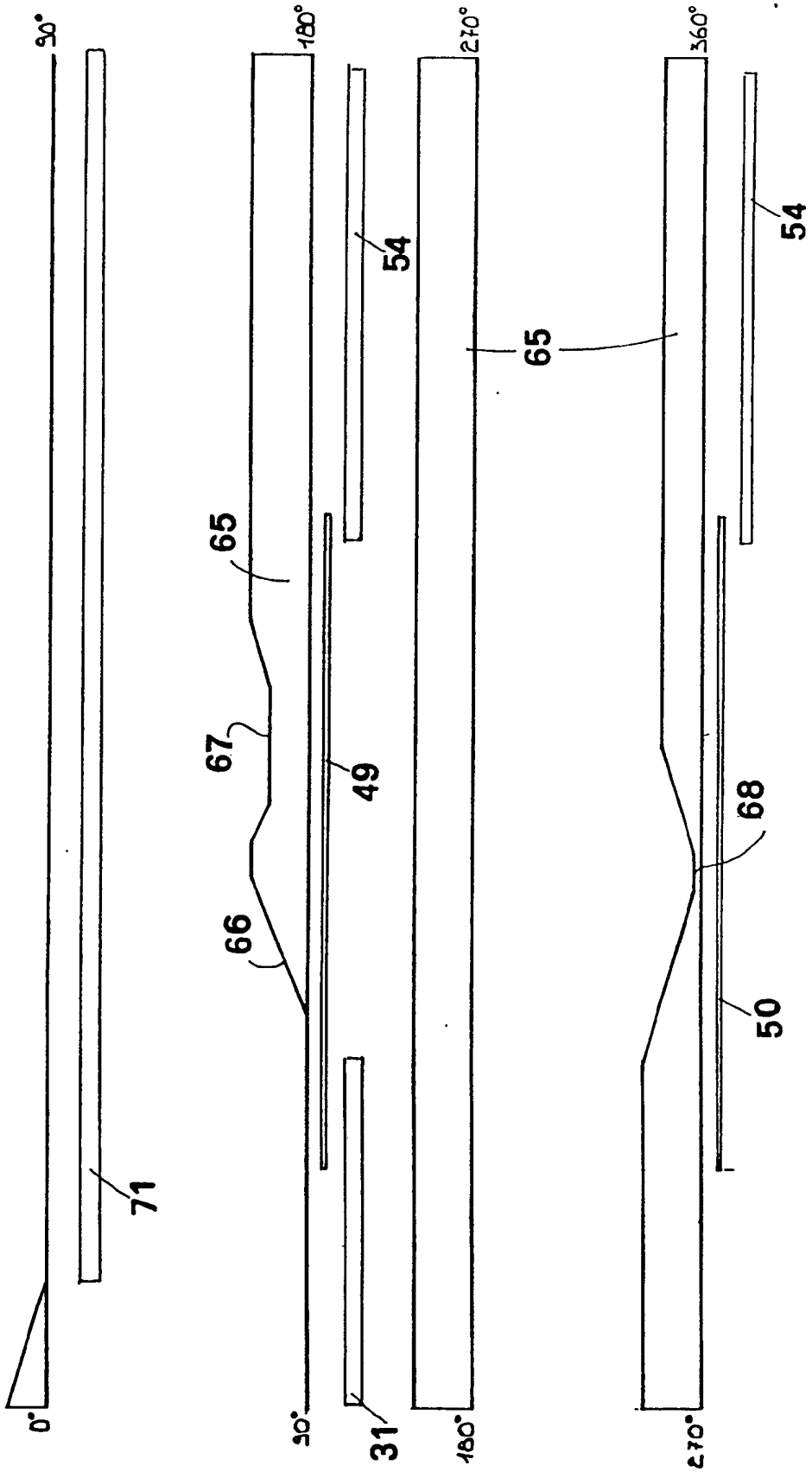

53
52
1
54
58
55a
61
45
60
64
55
59
65
63
62
71
72
70

fig.7

fig.8



European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 89 83 0535

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	FR-A-2 409 216 (SHIKOKU KAKOOKI CO., LTD) * Page 2, lines 4-25; page 5, line 15 - page 6, line 31; figures 1-5 *	1,3	B 65 G 47/14
A		4,5,6	
Y	FR-A-1 320 085 (R.A.P. VALENTIN) * Page 2, left-hand column, lines 16-20; figures 1-3 *	1,3	
A		5,6,7	
P,A	US-A-4 825 995 (J.C. NALBACH) * Column 3, lines 21-37; figure 2 *	8	
A	US-A-3 662 872 (J.C. NALBACH) * Abstract; column 3, line 51 - column 4, line 23; figures 3-10 *	1,3,4,5,6,7,9,10	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B 65 G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	08-03-1990	BEERNAERT J.E.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P0401)